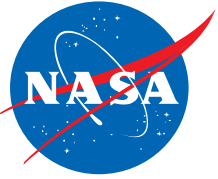


# Aeronautics Research Mission Directorate

Small Business Symposium  
November 17, 2008

Presented by **Tom Irvine**



# ARMD Mission and Principles

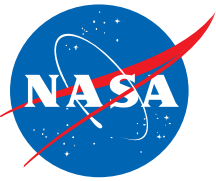
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## **The Overarching Mission of NASA's Aeronautics Research Mission Directorate (ARMD):**

- To advance U.S. technological leadership in aeronautics in partnership with industry, academia, and other government agencies that conduct aeronautics-related research.
- ARMD supports the Agency's goal of developing a balanced overall program of science, exploration, and aeronautics, and ARMD's research plans also directly support the National Aeronautics R&D Policy and accompanying Executive Order 13419.

## **The Three Core Principles of ARMD:**

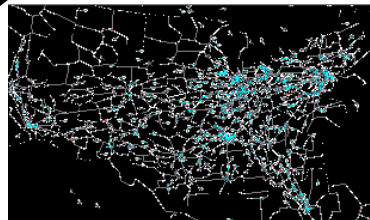
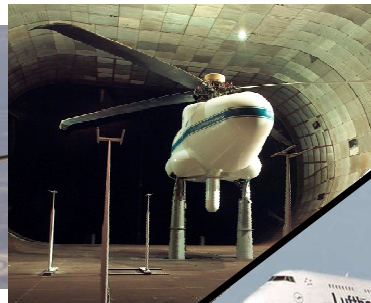
- We will dedicate ourselves to the mastery and intellectual stewardship of the core competencies of Aeronautics for the Nation in all flight regimes.
- We will focus our research in areas that are appropriate to NASA's unique capabilities.
- We will directly address the fundamental research needs of the Next Generation Air Transportation System (NextGen) in partnership with the member agencies of the Joint Planning and Development Office (JPDO).



# Aeronautics Programs

## Fundamental Aeronautics Program

Conduct cutting-edge research that will produce innovative concepts, tools, and technologies to enable revolutionary changes for vehicles that fly in all speed regimes.



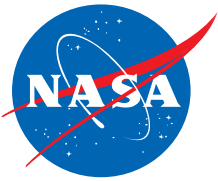
## Aviation Safety Program

Conduct cutting-edge research that will produce innovative concepts, tools, and technologies to improve the intrinsic safety attributes of current and future aircraft.



## Airspace Systems Program

Directly address the fundamental ATM research needs for NextGen by developing revolutionary concepts, capabilities, and technologies that will enable significant increases in the capacity, efficiency and flexibility of the NAS.



# Fundamental Aeronautics Program

## **Mastery of the principles of flight in any atmosphere at any speed**

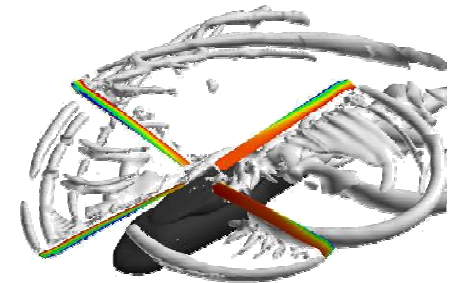
### ***Subsonic Fixed Wing***

- Develop revolutionary technologies and aircraft concepts with highly improved performance while satisfying strict noise and emission constraints
- Focus on enabling technologies: acoustics predictions, propulsion / combustion, system integration, high-lift concepts, lightweight and strong materials, GNC



### ***Subsonic Rotary Wing***

- Improve civil potential of rotary wing vehicles (vs fixed wing) while maintaining their unique benefits
- Key advances in multiple areas through innovation in materials, aeromechanics, acoustics, flow control, propulsion



### ***Supersonics***

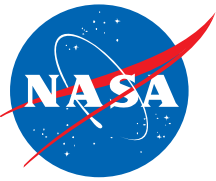
- Eliminate environmental and performance barriers that prevent practical supersonic vehicles (cruise efficiency, noise and emissions, vehicle integration and control)
- Supersonic deceleration technology for Entry, Descent, and Landing



### ***Hypersonics***

- Fundamental research in all disciplines to enable very-high speed flight (for launch vehicles) and re-entry into planetary atmospheres
- High-temperature materials, thermal protection systems, advanced propulsion, aero-thermodynamics, multi-disciplinary analysis and design, GNC, advanced experimental capabilities





# Aviation Safety Program

- Cutting-edge research that will produce tools, methods, concepts, and technologies to improve the intrinsic safety attributes of current and future aircraft.
- Overcome safety barriers that could otherwise constrain the full realization of NextGen.
  - Safety challenges include increased air traffic density, increased reliance on automation, increased diversity of vehicles, and increased complexity in the system.
  - We also need to transition from a diagnostic to a prognostic approach to identifying system-wide safety issues.

## Research Thrusts



Integrated Vehicle  
Health  
Management



Integrated  
Intelligent Flight  
Deck

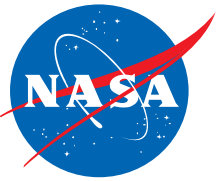


Aircraft Aging  
& Durability



Integrated  
Resilient Aircraft  
Control





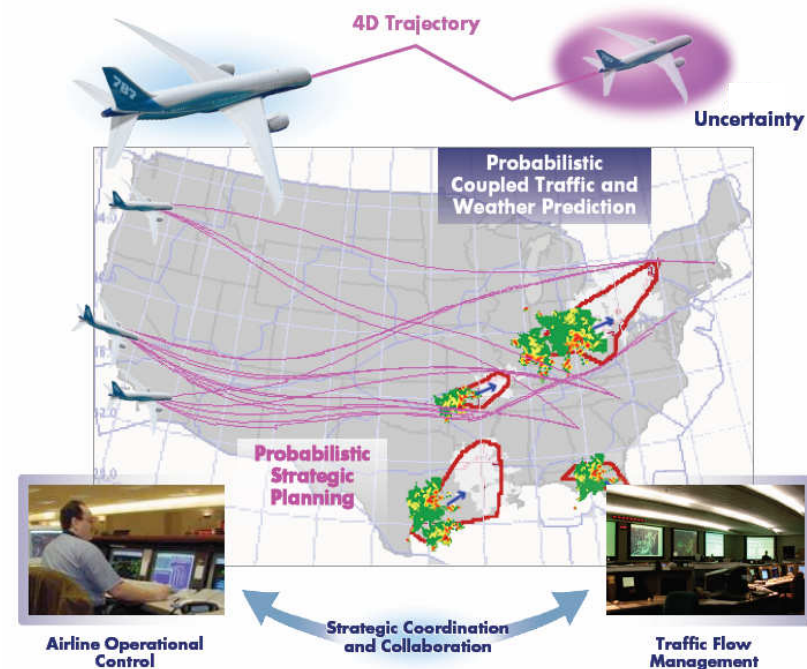
# Airspace Systems Program

## Program Objective

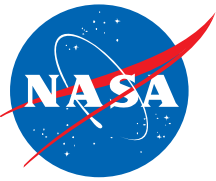
Directly address the fundamental ATM research needs for NextGen by developing revolutionary concepts, capabilities, and technologies that will enable significant increases in the capacity, efficiency and flexibility of the NAS.

**NextGen - Airspace Project:** Address demand/capacity imbalance problem in the most safe, equitable, and efficient manner, including the functional allocation of automation and humans to achieve substantial increases in airspace capacity.

**NextGen - Airportal Project:** Address factors leading to an airport where operators achieve maximum efficiency in the use of gates, taxiways, runways, and approach airspace while balancing requirements such as safety and environment.



- Both projects will conduct system-level design and analysis.
- Substantial leveraging of research across the two projects will occur.
- Results of the two projects will be integrated to ensure gate-to-gate solutions that are aligned with NextGen needs.



# Aeronautics Test Program

**Ensure strategic availability and accessibility of a critical suite of aeronautics test facilities necessary to meet aeronautics, agency, and national needs**

- Simulation and Flight Loads Lab Support
- Intelligent investment in, and divestment of test facilities infrastructure in line with strategic goals
- Provide consistent cost accounting practices, pricing policies, and performance measurements
- Pursue development of innovative test methods
- Create a renewed partnership with DOD to improve coordination and cooperation through the National Partnership for Aeronautical Testing (NPAT)

## Aero Ground Test Facilities Project

- Facility Operations Support
- Facility Maintenance and Upgrades
- Facility Related Research
- Facility Test Technology

## Flight Ops & Test Infrastructure Project

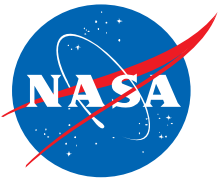
- Western Area Test Range
- Support Aircraft Capability
- Test Bed Aircraft Support



**ARC Unitary Wind Tunnel**



**F-15B Test-bed Aircraft with Supersonic Quiet Spike**

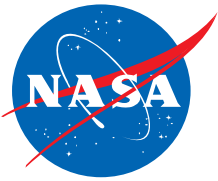


# 2008 ARMD SBIR Topics & Subtopics

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- **Fundamental Aeronautics**
  - Materials and Structures for Future Aircraft
  - Combustion for Aerospace Vehicles
  - Aero-Acoustics
  - Aeroelasticity
  - Aerodynamics
  - Aerothermodynamics
  - Flight and Propulsion Control and Dynamics
  - Propulsion Systems
  - Aircraft Systems Analysis, Design and Optimization
  - Rotorcraft

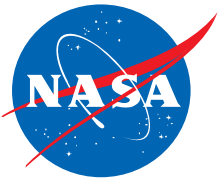




# 2008 ARMD SBIR Topics & Subtopics

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- Aviation Safety
  - Mitigation of Aircraft Aging and Durability-related Hazards
  - Sensing and Diagnostic Capability for Aircraft Aging and Damage
  - Prediction of Aging Effects
  - Aviation External Hazard Sensor Technologies
  - Crew Systems Technologies for improved Aviation Safety
  - Technologies for Improved Design and Analysis of Flight Deck Automation
  - On-Board Flight Envelope Estimation for Unimpaired and Impaired Aircraft
  - Engine Lifting and Prognosis
  - Robust Flare Planning and Guidance for Unimpaired and Impaired Aircraft
  - Detection of Aircraft Anomalies
  - Integrated Diagnosis and Prognosis of Aircraft Anomalies
  - Mitigation of Aircraft Structural Damage



# 2008 ARMD SBIR Topics & Subtopics

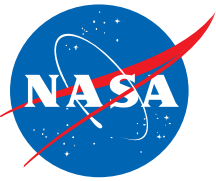
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- **Airspace Systems**

- NextGen Airspace
- NextGen Airportal

- **Aeronautics Test Technologies**

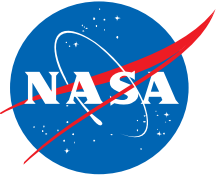
- Ground Test Technologies and Measurement Technology
- Flight Test Techniques and Measurement Technology



# Sample SB Awards Last Year

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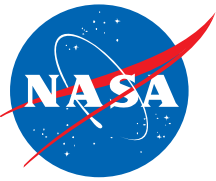
- *Multi-Axial Damage Index and Accumulation Model for Predicting Fatigue Life of CMC Materials*
- *High Temperature Shape Memory Alloy Technology for Inlet Flow Control*
- *Multifunctional Aerogel Thermal Protection Systems for Hypersonic Vehicles*
- *Lightweight High Temperature Beta Gamma Alloy/Process Development for Disk and Blade Applications*
- *Durable, High Thermal Conductivity Melt Infiltrated Ceramic Composites for Turbine Engine Applications*
- *Species Source Term Mapping for Reacting Flow CFD*
- *Turbulent Scalar Transport Model Validation for High Speed Propulsive Flows*
- *New Chemical Kinetics Approach for DSMC Applications to Nonequilibrium Flows*
- *An Adaptive Chemistry Approach to Modeling Emissions Performance of Gas Turbine Combustors*



# How Best to Work with ARMD

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- Learn how ARMD works, as well as what we do.
  - Use NASA's small business office([osbp.nasa.gov](http://osbp.nasa.gov))
  - Solicitations
    - Contract
    - Collaboration
    - SBIR ([www.sbir.nasa.gov](http://www.sbir.nasa.gov))
    - NRA ([www.aeronautics.nasa.gov/nra.htm](http://www.aeronautics.nasa.gov/nra.htm))
- Understand our programmatic goals
  - [www.aeronautics.nasa.gov](http://www.aeronautics.nasa.gov)
  - We select those proposals we feel can best advance our goals.
- Understand our programmatic requirements
  - Operational – test facilities and labs
  - Research – aeronautics technology research, some space access



# Long-Term Relationships with ARMD

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- What are you wanting to provide to NASA?
  - Studies (surveys, conceptual papers, etc.) – Occasionally a company is selected to be available for studies over a period of time, but this is a very small minority of the awards. Single-study awards usually do not result in follow-up work.
  - Research – Since this is usually in highly specialized areas, the opportunities are limited, but there is a better chance for follow-up work once your expertise is proven. Note: NASA sometimes is not the ultimate user of technologies developed through NASA – especially in aeronautics.
  - Operation – Good chance of long-term arrangement.
- What are you doing for yourself?
  - Consider ways to become valuable to NASA in more than one field.
  - Develop a non-NASA customer base for your product/service.
    - Leverage off NASA partners other contractors
    - Other government/industry that may need the same or similar product/service
- Contact:
  - Phil Milstead (202-358-4619, [phillip.l.milstead@nasa.gov](mailto:phillip.l.milstead@nasa.gov))